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Trends in spring and winter research CPUE of shrimp on Hawke Channel, 1994-1999

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Abstract

CPUE of shrimp (Pandalus spp) in Hawke Channel derived from Campelen 1800 trawl sets made during acoustic surveys showed a systematic increase from 1994 to 1996 but have since declined. The "hot zone" for shrimp was located at depths of 250-450 m. CPUE in this zone shows the same general trend, both winter and spring, as the CPUE in the full area.

Résumé

Les prises par unité d'effort (PUE) de la crevette (*Pandalus* spp) dans le chenal Hawke déterminé à partir de traits de chalut Campelen 1800 effectués dans le cadre de relevés acoustiques présentent une augmentation systématique de 1994 à 1996, pour ensuite décliner. La zone de grande concentration se situait à des profondeurs variant de 250 à 450 m. Les PUE de cette zone présentent la même tendance générale, tant en hiver qu'au printemps, tout comme les PUE de l'ensemble de la zone.

Introduction

Hawke Channel in NAFO 2J has been one of the most important fishing areas for shrimp in the 1990s. Historically, it is also an important area for Atlantic cod, and at present is the site of some rebuilding of the northern cod. Fishing sets have been conducted in Hawke Channel (NAFO 2J) in conjunction with acoustic surveys and studies of cod rebuilding since 1994. In this paper we report on the catches of shrimp from those sets.

Methods

Seven trips have been made since June 1994 (Table 1). The first trip was made with the Gadus Atlantica, the rest with the CCGS Teleost. Three trips were made in winter (Teleost 25 in Feb. 1996; Teleost 59 in Jan. 1998; Teleost 77 in Jan. 1999). Four trips were made in spring (Gadus 243 in June 1994; Teleost 30 in June 1996; Teleost 65 in June 1998). The Campelen 1800 shrimp trawl was used on all trips. Fishing sets were made around the Channel at 5 classes of acoustically assigned targets: cod, shrimp, shrimp-arctic cod mix, capelin, and null sets where little or nothing was detected on the echosounder. Many sets targeted at finfish had recognizable concentrations of shrimp visible on the echosounder and these were considered to be secondary targets. Sets were of 15-30 minutes duration. All set results have been standardized to 15 minutes at 3 knots.

Year	Trip	Month
1994	Gadus Atlantica 243	June
1995	Teleost 14	June
1996	Teleost 25	February
1996	Teleost 30	June
1998	Teleost 59	January
1998	Teleost 65	June
1999	Teleost 77	January

Table 1. Trips to Hawke Channel, 1994-1999.

Results

A total of 121 fishing sets were made from 1994-99 (Fig. 1). The sets were distributed around the Channel and many were made in almost the same location in several years. The areas of high catches were similar in all years (Fig. 2).

Sets targeted at shrimp had higher catch rates than sets targeted at other species (Table 2; Duncan's Multiple Range test, $P<0.05$). Catch rates among the other categories did not differ significantly. For further analyses all sets were pooled to keep "n" as high as possible. If this introduced any bias it would be toward increasing catches in more recent years when most of the targeted sets on shrimp were conducted.

Table 2. Shrimp catch statistics based on primary set target as assigned from the acoustic data (a), ANOVA (b) and Duncan's Multiple Range Test of differences among groups (c). All sets were made with the Campelen 1800 and are standardized to 15 minutes at 3 knots.

a)

Target class	N	Cpue (max)	Cpue (mean, SE)	Median
Cod	69	766	99, 17	48
Shrimp	5	682	359, 132	306
Shrimp-arctic cod	32	285	70, 13	36
Capelin	2	42	32, 10	32
Null set	9	134	45, 16	23

b)

	Sum Squares	df	Mean square	F	*P*
Between groups	401087	4	100272	5068	.000
Within groups	1975951	112	17642		
Total	2377038	116			

c)

Target class	N	Subset (P<0.05) 1	Subset (P<0.05) 2
Capelin	2	32	
Null set	9	45	
Shrimp-arctic cod	32	70	
Cod	69	99	
Shrimp	5		359

Overall, catch rates increased from 1994 to 1996 then declined (Fig. 4). In 1996, mean catch rates were approximately 200 kg per standard set. Both winter and spring mean catch rates declined after 1996 to approximately 50 kg per standard set in spring 1998 and winter 1999.

Larger shrimp were caught in deeper waters (Fig. 3).

Catches were higher in waters in the mid-range of depths fished (ca. 250-450 m) (Fig. 5). The numbers of sets conducted in the hot zone (250-450 m) was not the same each year (Chi square P <0.001). This inequality could have introduced bias into the overall CPUE comparison. Hence, CPUE was recalculated for only the hot zone for each year (Fig. 6). The results are similar to the overall results in Fig. 1 but predictably less certain because of lower "n".

Conclusions

- Shrimp can be recognized on a calibrated 38 kHz echosounder
- Shrimp in Hawke Channel are widely distributed from about 200 m to 600 m and body size is larger with increasing depth
- Shrimp in Hawke Channel achieve the highest densities at depths between approximately 250 and 450 m (we note this is the same depth that cod achieve maximum densities in the same area)
- Shrimp in Hawke Channel achieved maximum densities in 1996 that have since declined.

Fig. 1. Set locations in Hawke Channel from 1994 to 1999 in winter and spring by year.

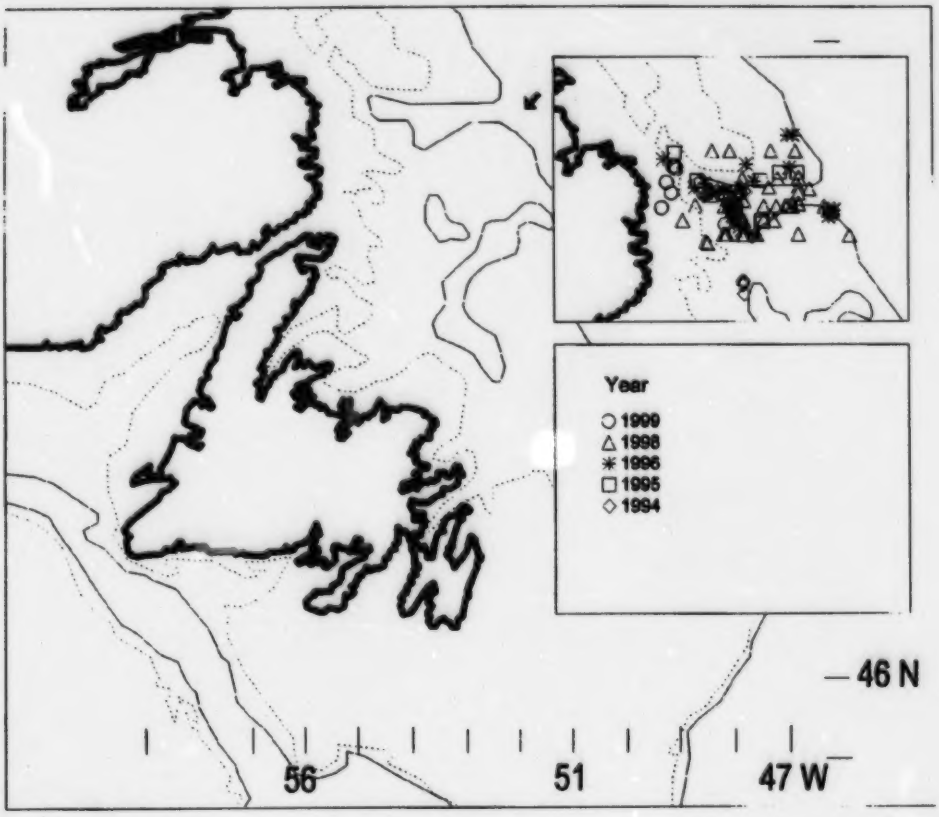

Fig. 2. Standardized CPUE for shrimp from 1994 to 1999 in winter and srpring.

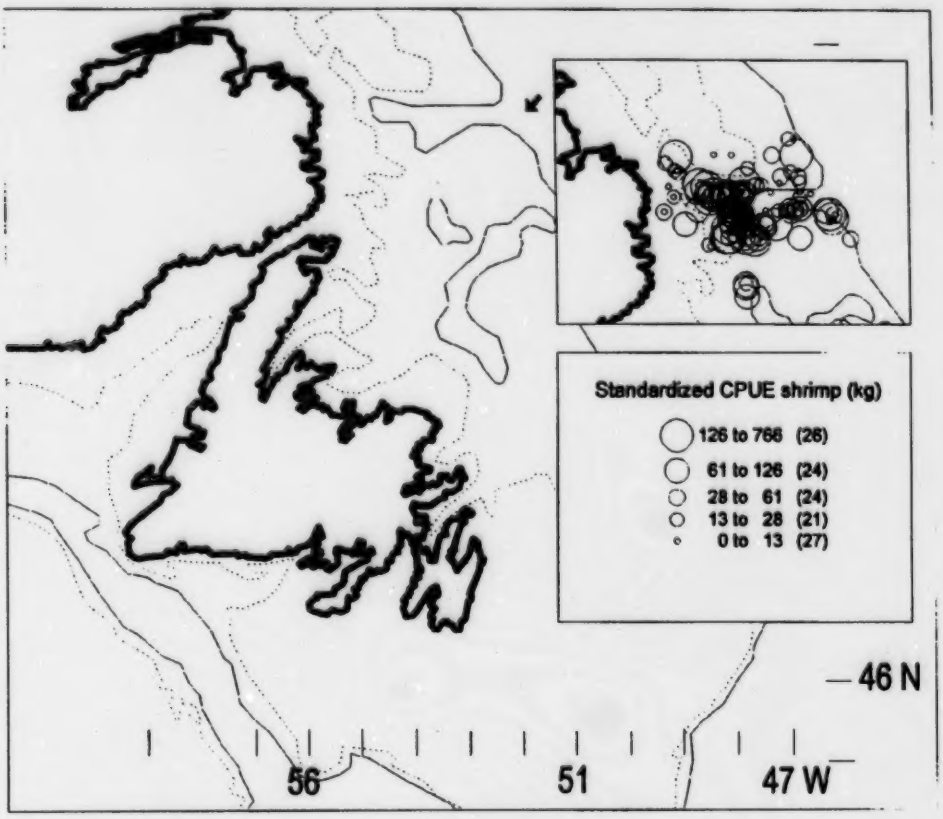

Fig. 3. Individual shrimp weight at depth (1998-1999)

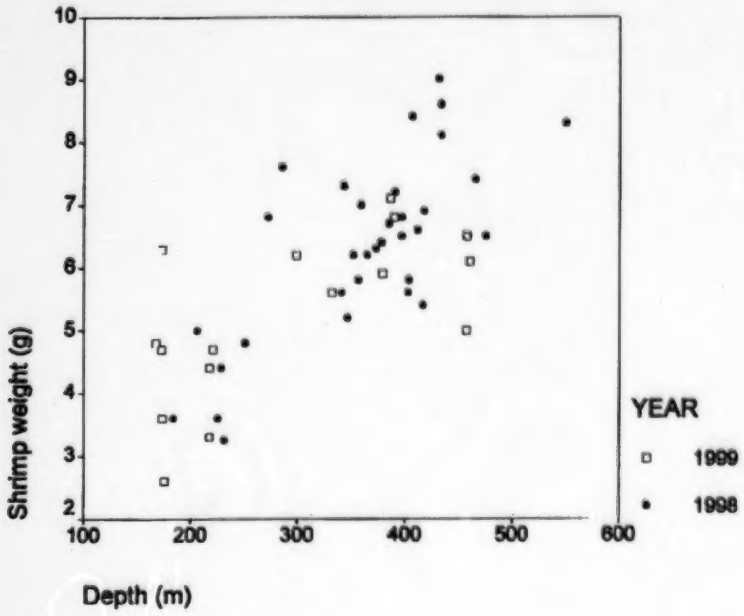

Fig. 4. CPUE for shrimp in Hawke Channel by year and season. CPUE standardized t 15 minute sets at 3 knots.

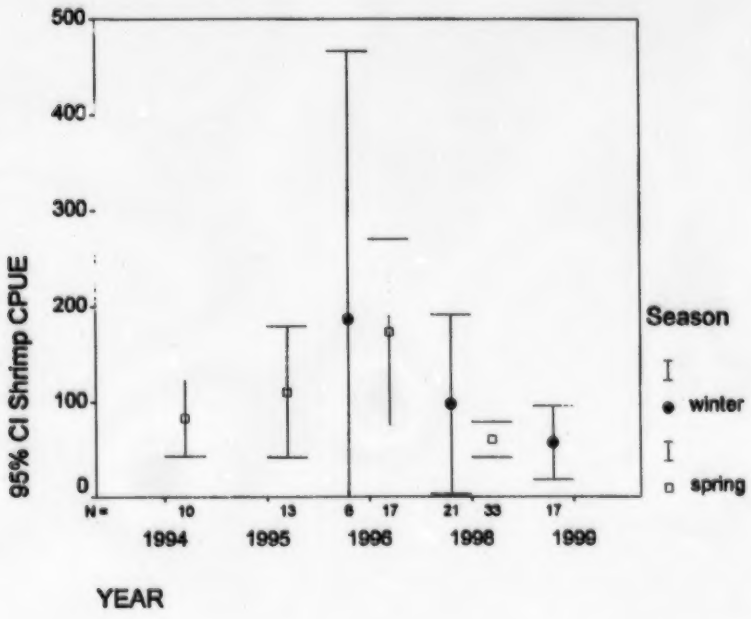

Fig. 5. Shrimp CPUE at depth (1994-1999). CPUE standardized to 15 minutes at 3 knots.

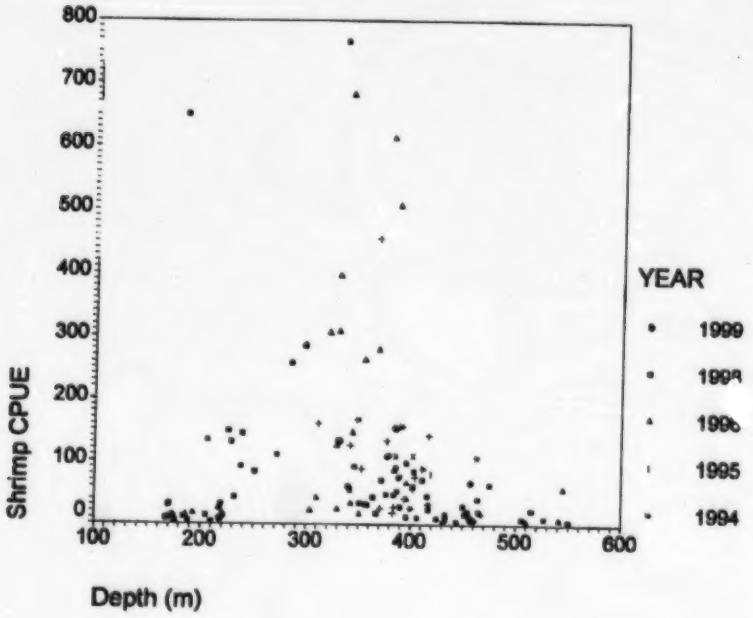

Fig. 6. Shrimp CPUE in Hawke Channel "Hot zone" : 250-450 m, 1994-99. CPUE standardized to 15 minutes at 3 knots.